

Teaching Values through a Problem Solving Approach to Mathematics

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Abstract— The purpose of this article is to suggest one of the many ways in which value education can be incorporated into existing mathematics curriculum and approaches to teaching mathematics. In particular, it will focus on ways in which values education can be enhanced by utilizing a problem-solving approach of the discipline. Presenting a problem and developing the skills needed to solve problem is more motivational than teaching the skills without a context. It allows the students to see a reason for learning the mathematics, and hence to become more deeply involved in learning it. Teaching through problem solving can enhance logical reasoning, helping students to be able to decide what rule, if any, in a situation requires, or if necessary to develop their own rules where an existing rule cannot be directly applied.

Human life is also a problem solving game throughout. If a student's mind is trained to derive logical conclusion in certain situation then he will always be a better equipped person to handle even the toughest situation in a controlled and balanced manner.

This article suggests that a problem-solving approach can contribute significantly to the outcomes of a Mathematical education. Problem solving is an important component of mathematical education because it is the single tool which seems to be able to achieve all three of the values of mathematics: functional analysis, logical derivation and aesthetic temperament.

Value education in mathematics help students find their rightful place in the world. Value in a Mathematics curriculum add a new dimension to promote an all round personality development of a students and nurtures their academic career in a better way.

Index Terms— Mathematical Values, Problem-solving approach, Values.

I. INTRODUCTION

Mathematics is a living subject which seeks to understand patterns that permeate both the world around us and the mind within us. Although the language of mathematics is based on rules that must be learned, it is important for motivation that students move beyond rules to be able to express things in the language of mathematics. This transformation suggests

changes both in curricular content and instructional style. It involves renewed effort to focus on:

- Seeking solutions, not just memorizing procedures;
- Exploring patterns, not just memorizing formulas;
- Formulating conjectures, not just doing exercises.

Solving problems parallels very closely the creation of mathematics. By encouraging problem solving in mathematics classrooms we are helping show that there is another aspect to mathematics that has a much more human face and is more interesting than simply following rules.

II. WHY DO PROBLEM SOLVING?

Using a problem solving approach to teaching and learning maths is of value to all students and especially to those who are high achieving. The reasons for using problem solving are summarized as below

- Problem solving places the focus on the student making sense of mathematical ideas. When solving problems students are exploring the mathematics within a problem context rather than as an abstract.
- Problem solving encourages students to believe in their ability to think mathematically. They will see that they can apply the maths that they are learning to find the solution to a problem.
- Problem solving provides ongoing assessment information that can help teachers make instructional decisions. The discussions and recording involved in problem solving provide a rich source of information about students' mathematical knowledge and understanding.
- Good problem solving activities provide an entry point that allows all students to be working on the same problem. The open-ended nature of problem solving allows high achieving
- Students to extend the ideas involved to challenge their greater knowledge and understanding.
- Problem solving develops mathematical power. It gives students the tools to apply their mathematical knowledge to solve hypothetical and real world problems.
- Problem solving is enjoyable. It allows students to work at their own space and make decisions about the way they explore the problem. Because the focus is not limited to a specific answer students at different ability levels can experience both challenges and successes on the same problem.
- Problem solving better represents the nature of mathematics. Research mathematicians apply this exact approach in their work on a daily basis.

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III. HOW TO TEACH HUMAN VALUES BY INCORPORATING PROBLEM SOLVING INTO THE MATHEMATICS PROGRAM

This section will describe the types of problem solving which can be used to enhance the values. There are three types of problems to which students should be exposed:

- Word problems : Preparing pupils for the challenges of life. For example how many liters of milk are consumed in your town in a day? Or how much water is wasted by an average family in a week?
- Non-routine problems: Encouraging the development of general knowledge and common sense. For example What is my mystery number ? Or If I divide by 13 the remainder is 1.
- "Real" problems : Engaging pupils in service to society and uses mathematics as a tool to find a solution. There is another subclass of problems called puzzles. A puzzle is a particular type of problem that usually requires little prior mathematical knowledge.

IV. SPECIFIC CHARACTERISTICS OF A PROBLEM-SOLVING APPROACH

Specific characteristics of a problem-solving approach includes:

- Interactions between students/students and teacher/students.
- Mathematical dialogue and consensus between students.
- Teachers providing just enough information to establish background/intent of the problem, and students clarifying, interpreting, and attempting to construct one or more solution processes.
- Teachers accepting right/wrong answers in a non-evaluative way.
- Teachers guiding, coaching, asking insightful questions and sharing in the process of solving problems.
- Teachers knowing when it is appropriate to intervene, and when to step back and let the pupils make their own way.
- A further characteristic is that a problem-solving approach can be used to encourage students to make generalizations about rules and concepts, a process which is central to mathematics.

CONCLUSION

This article has suggested some reasons why problem solving is an important vehicle for educating students for life by promoting interest, developing common sense and the power to discriminate. In particular, it is an approach which encourages flexibility, the ability to respond to unexpected situations or situations that do not have an immediate solution, and helps to develop perseverance in the face of failure. A problem-solving approach can provide a vehicle for students to construct their own ideas about mathematics and to take responsibility for their own learning. While these are all important mathematics skills, they are also important life skills and help to expose pupils to a values education that is essential to their holistic development.

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